Robust, High Capacity, High Power Lithium Ion Batteries for Space Systems, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Lithium ion battery technology provides the highest energy density of all rechargeable battery technologies available today. However, the majority of the research into this technology is focused on developing lower cost materials for the consumer electronics market, and not on high reliability or long life. As a result, the materials developed do not meet the needs of the aerospace industry in terms of mass and volume specific storage capacities, and suppliers will often alter the formulation or process with little warning. It is therefore proposed to use domestically manufactured, advanced anode, cathode, and electrolyte materials to design advanced batteries for aerospace systems. The proposed anode material, developed at Applied Sciences, is a nanometer-scale composite of silicon and carbon nanofiber capable of providing 1000 mAh/g with coulombic efficiencies above 99.6% to moderate cycle numbers. The electrolyte will be a multi-blend of asymmetric linear carbonates capable of operating from -40

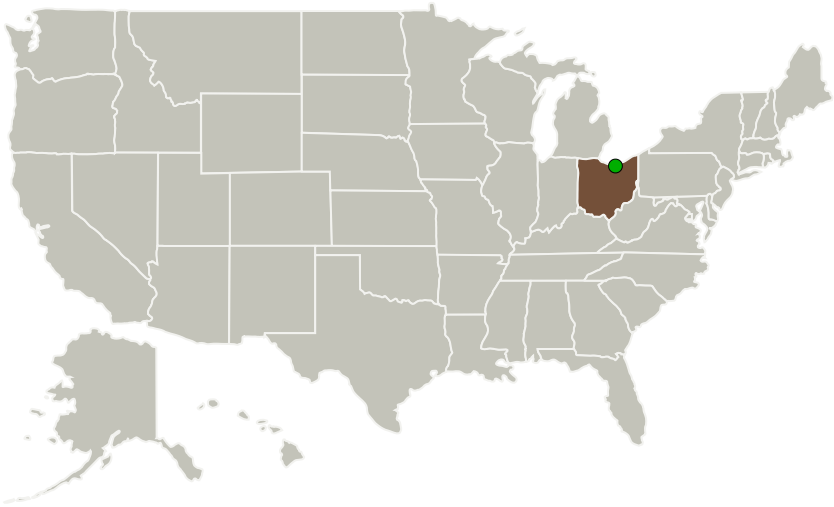
o

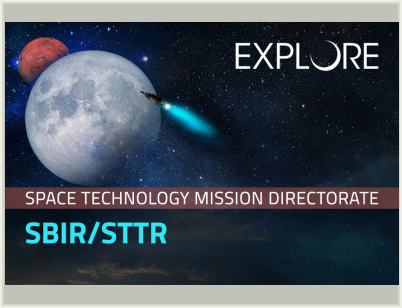
C to +70

o

C. These materials will be coupled with high capacity cathode materials to enable the production of cells with specific energy (> 300 Wh/kg) and an energy density (> 600 Wh/l) that can operate across a wide temperature range. Cells fabricated under this program will be characterized for electrochemical performance and safety.

Primary U.S. Work Locations and Key Partners





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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Applied Sciences Inc	Lead Organization	Industry	Cedarville, Ohio
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations
Ohio

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138471)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Applied Sciences Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

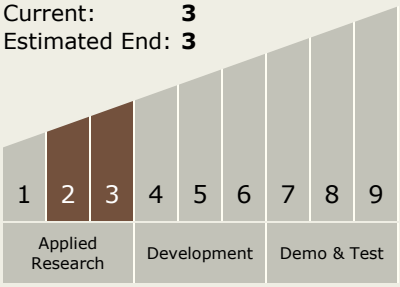
Carlos Torrez

Principal Investigator:

David A Burton

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.1 Electrochemical: Batteries

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System